



## ABSTRACT / ZUSAMMENFASSUNG / ABREGE

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Es wird vorliegend eine Sicherheitseinrichtung (1) für die Lagerung von Pedalen (2) in Kraftfahrzeugen, insbesondere Personenkraftfahrzeugen, beschrieben mit einem im Bereich eines sich bei einer Frontalkollision des Fahrzeugs spürbar in einen Fahrgastraum hinein verformenden Wandbereichs einer Spritz- oder Querwand (3) angeordneten Lagerbock (5), in dem eine Pedalachse (6) mindestens eines auf eine Druckstange (7) einwirkenden, schwenkbaren Pedals (2), insbesondere eines Bremspedals, gehalten ist. Dabei ist die Pedalachse (6) im Lagerbock (5) in einer sich zumindest im wesentlichen horizontal erstreckenden Führung gehalten, wobei die Führung in horizontaler Richtung jeweils Begrenzungen aufweist. Weiterhin ist die Pedalachse während des Normalbetriebes in einer in Vorwärtsfahrtrichtung gesehen vorderen Position der Führung fixiert und diese Fixierung wird bei einer Frontalkollision aufgehoben.

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**B7B BSDA BSES**

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(54) Abstract Title  
**Collapsible pedal mechanism for an automobile**

(57) A pedal box for pivotally mounting one or more control pedals 1 of an automobile comprises a pivot shaft 2 supported between side rails of a mounting bracket 4 by means of shaft holders 3 to either end of the shaft so that in the event of a front-end impact the pedal shaft can be released from the bracket so that the chance of the pedal interfering with the occupants feet is reduced. Each shaft holder comprises a shaft support portion (12 in figure 2), a pair of spaced apart anchorages (15) secured to the side rail on opposite sides of the shaft support portion, and a line of weakness (14) formed across the shaft support portion. The mounting bracket is designed so that upon a front-end impact of the automobile the spaced anchorages on each shaft holder spread apart (see figure 7) causing fracture of the shaft holders along their lines of weakness and release of the pivot shaft.

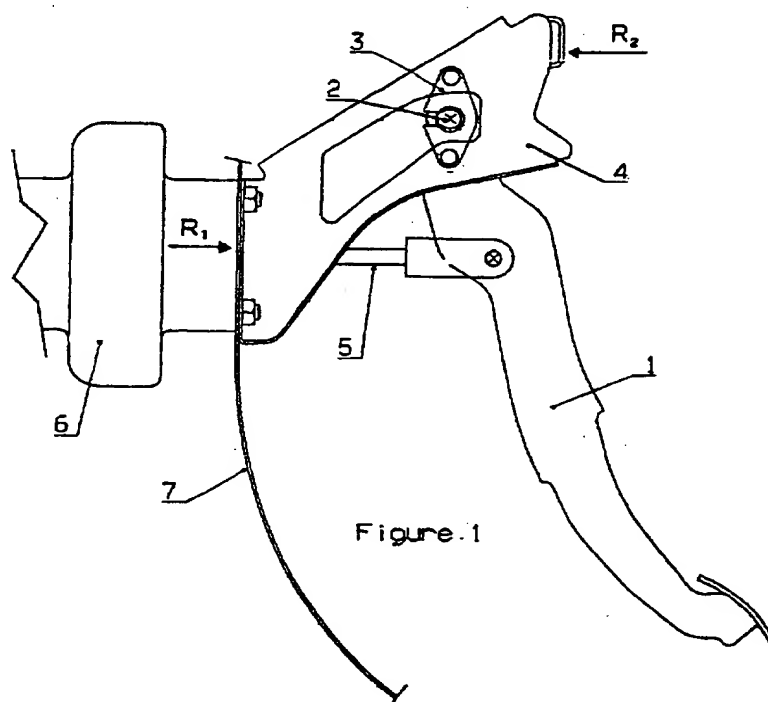


Figure 1

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy. The claims were filed later than the filing date but within the period prescribed by Rule 25(1) of the Patents Rules 1995. This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

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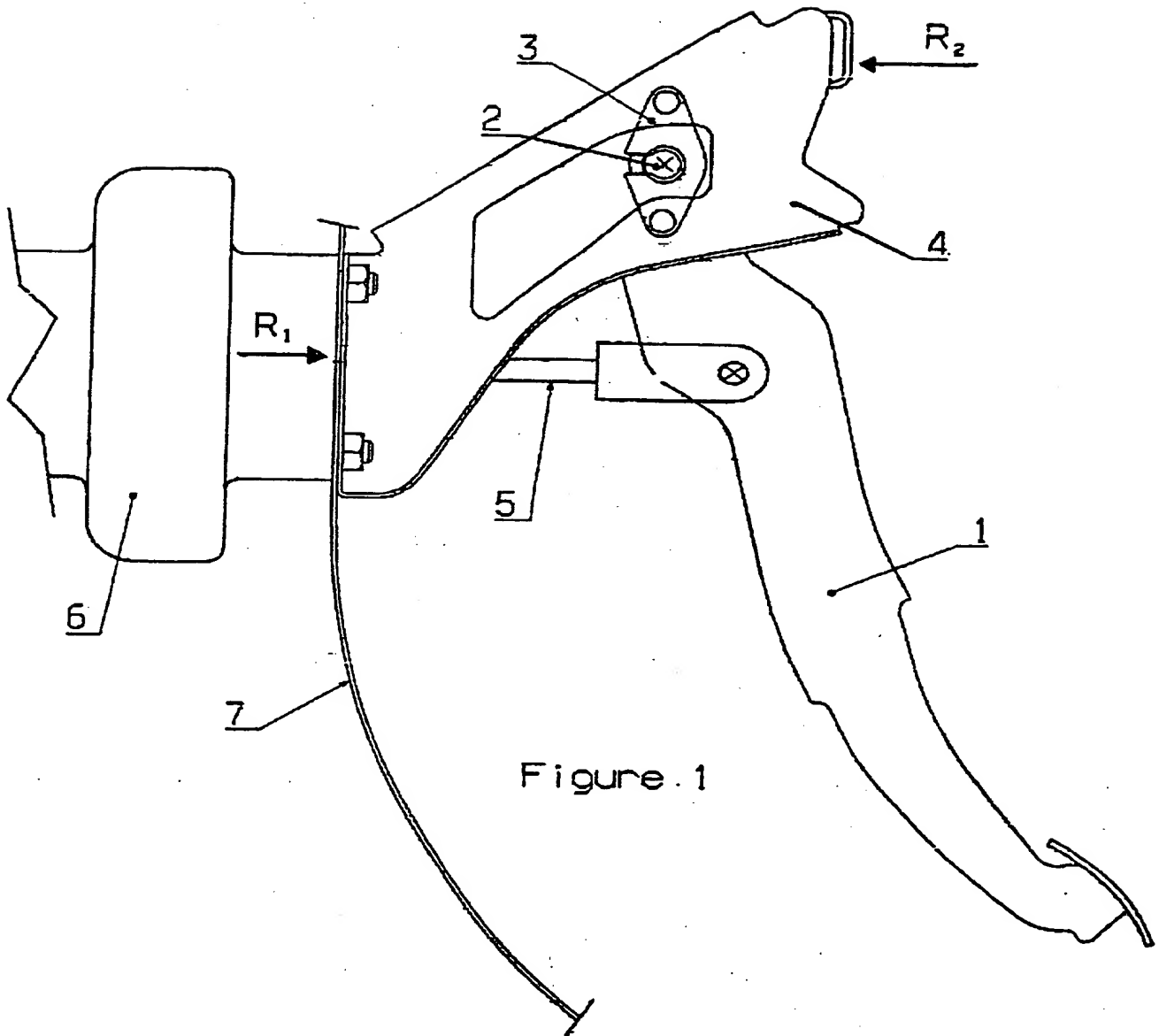


Figure .1

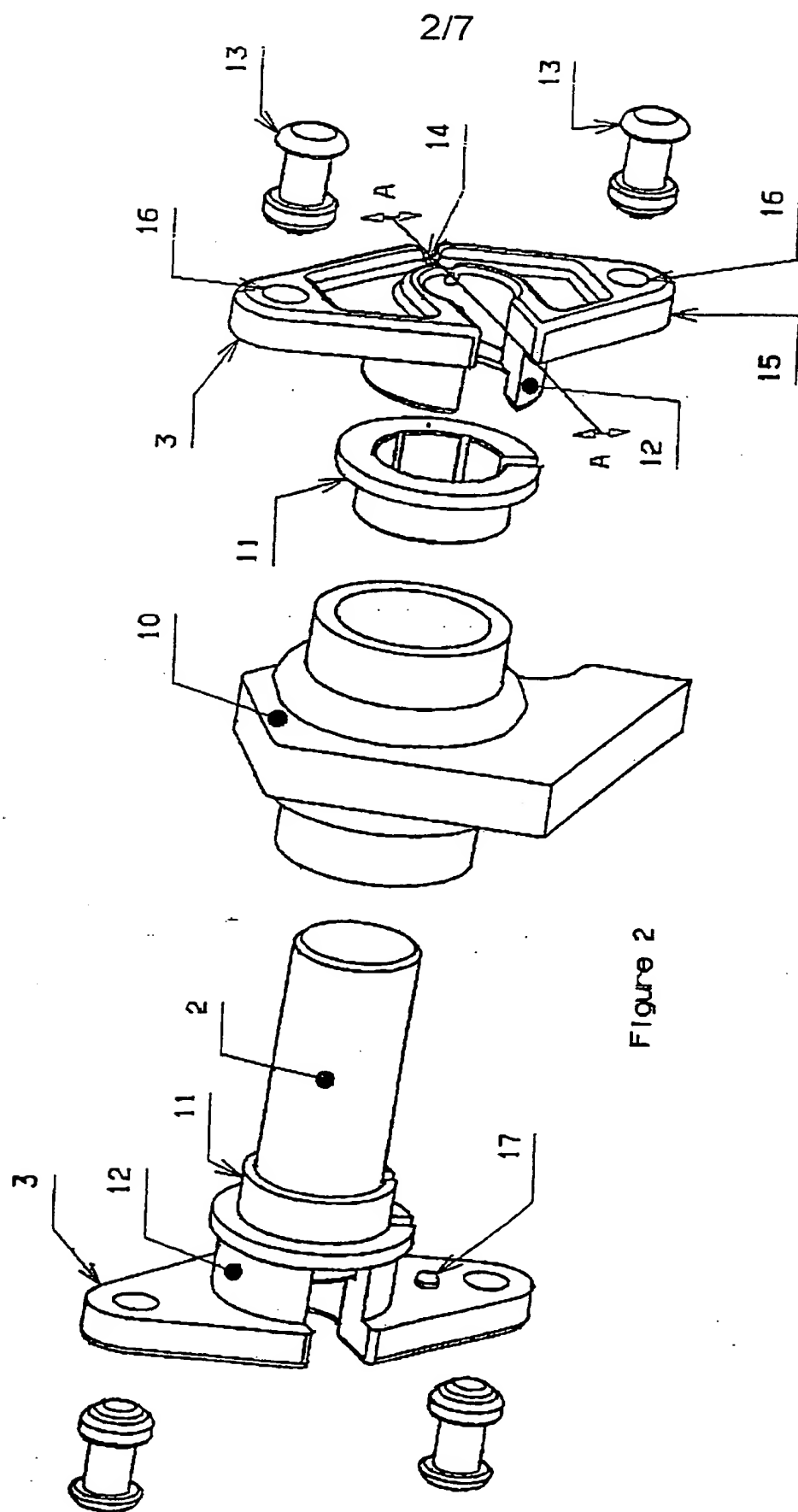


Figure 2

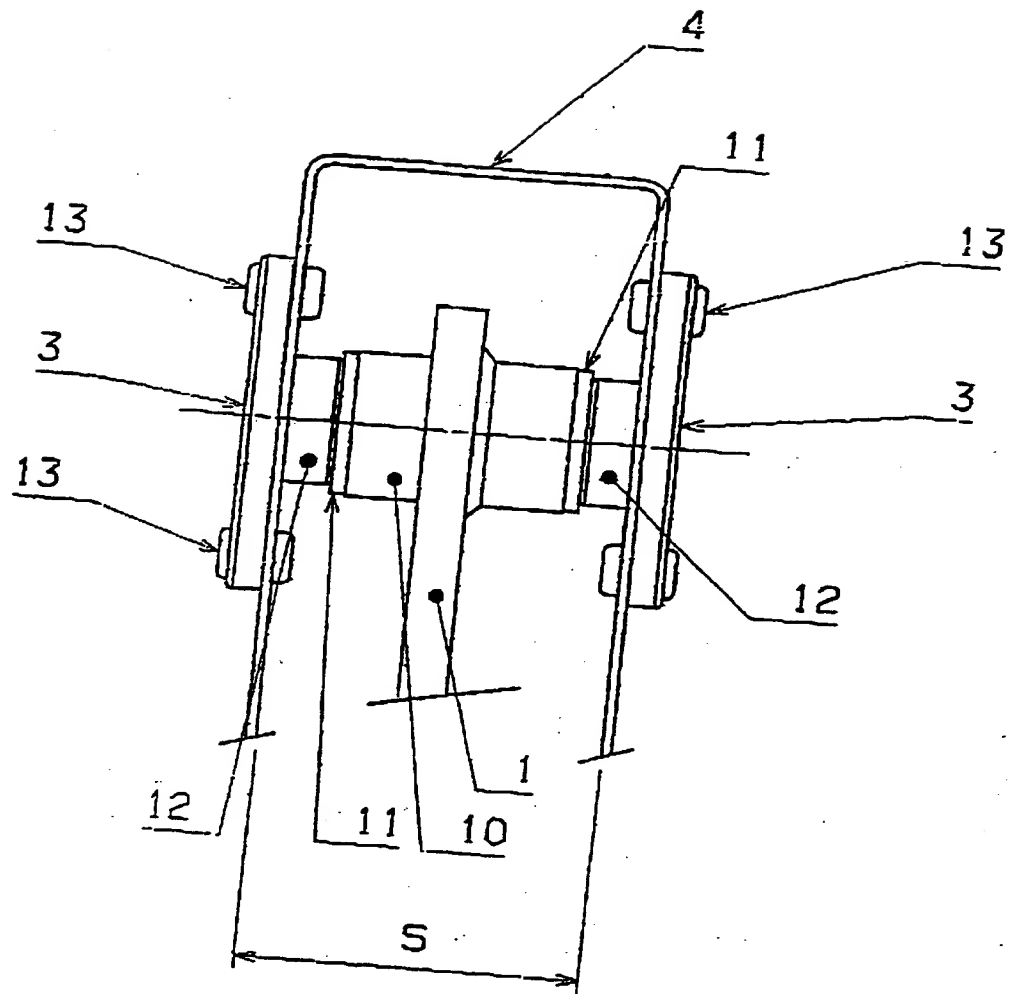


Figure 3

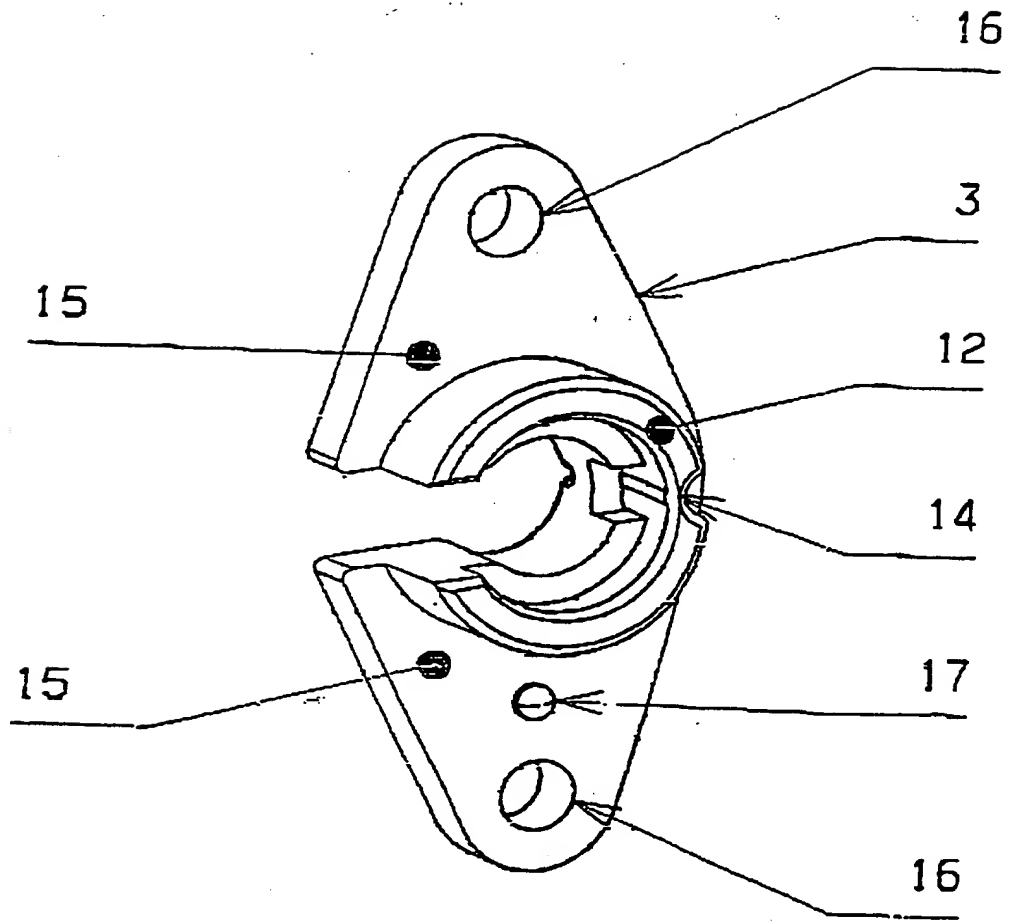


Figure 4

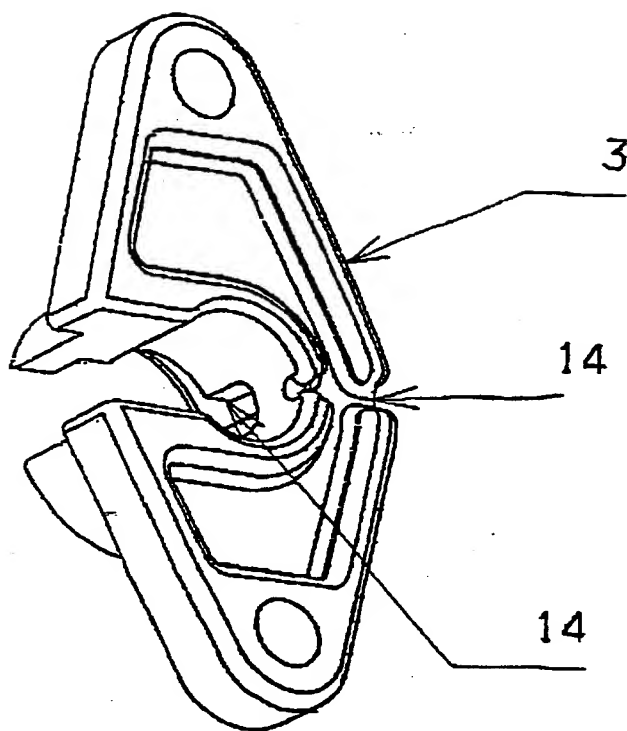


Figure 5



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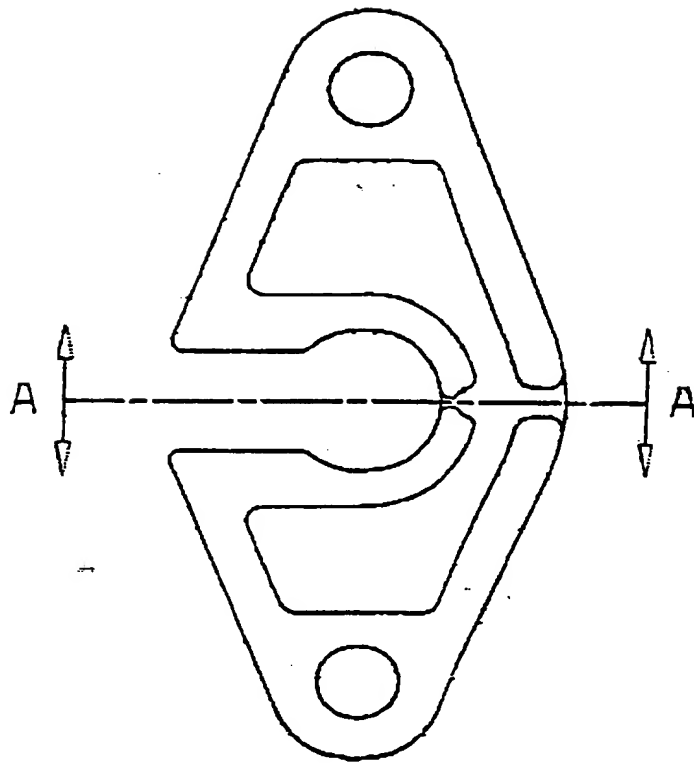


Figure 6

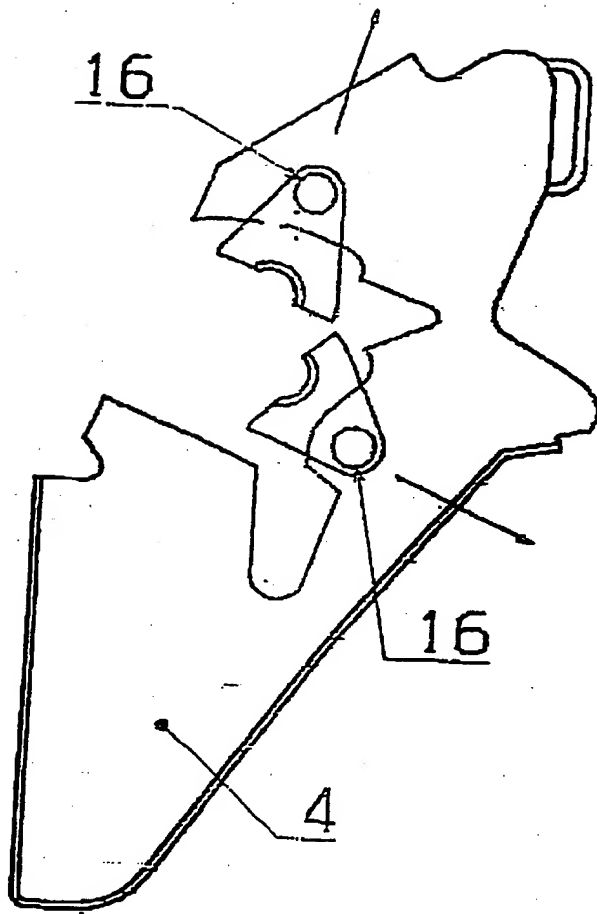


Figure 7

TITLE

Collapsible Pedal Box

DESCRIPTION**Field of the Invention**

This invention relates to pedal boxes for automobiles, and to structures which are designed to collapse in the event of a front-end vehicle collision.

**Background Art**

The improved design of safety shell structures around the driving compartment of a motor vehicle, and the improvements in the shock absorbing characteristics of engine compartments, have meant that it is now much less likely that the driver of a vehicle in a front-end collision will be killed outright. With that increase in vehicle safety comes another concern, which is that the driver whose life has been spared by good vehicle design should not become injured or trapped in the vehicle by the pedal box structure around the driver's feet.

Brake and clutch pedal boxes have been proposed which collapse on application of an excessive load such as that applied by the forward momentum of a driver when the vehicle is in a front-end collision. A collapse of the pedal box in such a situation permits it to move forward and away from the driver's feet, providing important extra leg-room to reduce the risk of the driver's feet becoming trapped in the accident. Even a few centimetres of extra leg-room in such circumstances can be a significant safety advantage.

One prior proposal is that the pivot shaft providing the pivotal mounting for the vehicle pedal should have splined ends which are a friction fit in the opposite walls of a

fixing bracket supporting the pedal. The fixing bracket should be designed to splay apart on the excess pressure which would be applied in consequence of a front-end impact of the vehicle, and in splaying apart would release one or both ends of the pivot shaft, thereby permitting the pedal to move away from the pedal box. In this way the danger of trapping the driver's feet by the pedal box in the case of an accident could be reduced. One disadvantage of the above design of collapsible pedal box is that as the sides of the fixing bracket move apart they tend to release one end only of the pivot shaft of the pedal. The other end is retained by the fixing bracket which then twists under the torque applied by the vehicle impact and the pressure of the driver's foot, and the twisting of the fixing bracket causes a twisting of the pedal itself which can create a potential entrapment of the driver's other foot possibly more damaging than the entrapment which the design seeks to avoid.

It is an object of the invention to provide a collapsible pedal box for an automobile which avoids the above problem.

#### **The invention**

The invention provides a pedal box for pivotally mounting control pedals of an automobile. A pivot shaft for one or more pedals is pivotally supported between side rails of a mounting bracket in such a manner that the pivot shaft is released from the side rails in the event of a front-end impact of the automobile. Each end of the pivot shaft is received in a shaft holder which comprises a shaft support portion supporting the pivot shaft, a pair of spaced anchorages secured to the pedal mounting on opposite sides of the shaft support portion, and a line of weakness formed across the shaft support portion. The pedal mounting bracket is designed so that on a front-end impact of the automobile the spaced anchorages of each pair will

spread apart, causing fracture of the shaft holders across their shaft support portions, and release of both ends of the pivot shaft of the pedal.

The shaft support portions of the shaft holders are literally pulled apart to fracture across their lines of weakness in the event of a vehicle front-end collision. The pulling apart is a function of the design of the pedal mounting bracket which should be designed to spread the spaced anchorages apart in the event of a front-end impact. The fracturing of the shaft holders across their lines of weakness can however be made more certain by designing each shaft support portion to surround the associated pivot shaft end only partially, as a C-shaped shaft support; and by aligning the shaft holders so that the pivot shaft ends are biased in the direction of the openings in the C-shaped shaft support portions when excess force is applied to the pedal or pedals in a front-end impact situation, so that the pedal pressure itself applies a cam action on the shaft support portions, opening the cusps of each 'C' apart and imposing strain on the shaft holders to encourage fracture.

The shaft holders may be die-cast from metal, or may be made of plastics materials or ceramics. The choice of material should take account of the fact that the shaft end holders act as the sole supports for the pivot shafts of the pedal box and of the fact that they should fracture along their lines of weakness when the anchorages are spread apart. Thus any material which is hard but brittle to permit easy fracture will be well suited to the shaft holder functions.

Preferably the pivot shaft length is shorter than the spacing apart of the opposed internal side walls of the mounting bracket and the shaft holders extend towards each other from those opposed internal walls to hold the ends of the pivot shaft within the space separating the opposed

internal side walls of the mounting bracket. Thus in a front-end impact situation when the shaft holders fracture and release the ends of the pivot shaft, the pivot shaft can fall away from the mounting bracket without fouling any part of that bracket. If desired the shaft holders may be mounted from the outsides of the mounting bracket, and may carry extended shaft support portions which extend through the wall thickness of the mounting bracket and into the space separating the opposed internal side walls of the mounting bracket.

#### Drawings

Figure 1 is a side view of a pedal box according to the invention.

Figure 2 is an exploded perspective view of the pivot shaft and shaft holders of the pedal box of Figure 1. No mounting brackets are shown in Figure 2.

Figure 3 is a front view of the pedal box of Figure 1 showing only part of the pedal itself.

Figure 4 and 5 are perspective views from opposite sides of one of the two pivot shaft holders of Figure 2.

Figure 6 is a side view of the pivot shaft holder of Figures 4 and 5 showing the line of weakness A-A.

Figure 7 is a side view of the mounting bracket of Figure 1 after a front-end impact of the vehicle, showing the fracture of the shaft holder anchored thereon.

In Figure 1 the general arrangement of a motor vehicle pedal box is shown. The pedal is a brake pedal 1, but the invention is equally applicable to clutch or accelerator (throttle) pedals. The pedal 1 is pivotally mounted on a pivot shaft 2 which is supported between two shaft holders 3 anchored on opposite sides of a mounting bracket 4 of the vehicle. Depression of the pedal 1 causes movement of a push rod 5 which acts on a brake servo 6 to cause brake actuation in known manner. The brake servo 6 is mounted on an engine compartment side of a vehicle bulkhead 7, and

the pedal box including the mounting bracket 4 is mounted on a passenger compartment side. In the case of a front-end impact of the vehicle, the brake servo and bulkhead are forced towards the driver in the direction of the arrow  $R_1$  but the inertia of the driver causes an opposing force in the direction of the arrow  $R_2$ .

Figures 2 and 3 show the detail of the pedal mounting. The pedal itself, not shown in Figure 2, is fast to a pedal pivot tube 10 which is mounted on the pivot shaft 2 between two bearing bushes 11. The ends of the pivot shaft 2 are supported by the two shaft holders 3. The shaft holders 3 extend through the side walls of the mounting bracket 4 (see Figure 3) and are secured thereto from the outside, although they have shaft support portions 12 which extend to the insides of the side walls of the mounting bracket and support the pivot shaft wholly within the space S separating the two walls of the mounting bracket 4. It is usual for a return spring for the pedal 1 to be wrapped around the pivot tube 11, although no return spring has been shown in the drawings of this Specification.

It will be appreciated that in modern vehicle design a single pedal box will support both or all of the vehicle operating pedals. Thus although Figures 1 to 3 show only one pedal supported in the box, in practice both or all vehicle pedals would be arranged side by side, each with its own pivot shaft 2 or optionally two pedals being supported on a single pivot shaft 2.

The assembly of the pedal box of Figures 1 to 3 is as follows. First a subassembly is created of one of the shaft holders 3 and the pivot shaft 2. Suppose that is the shaft holder 3 on the left hand side of Figure 3. A further subassembly is created of the pedal 1 on its pivot tube 10, the two bearing bushes 11, and the return spring if appropriate. The pedal subassembly is presented up

into the space S between the two sides of the mounting bracket 4, and the pivot shaft subassembly is threaded through the pivot tube 10 until the left hand shaft holder is flush against the left hand outer wall of the mounting bracket. Then the right hand shaft holder 3 is fitted from the right hand outer wall of the mounting bracket 4 until its shaft support portion 12 engages the right hand end of the pivot shaft 2. Finally the two shaft holders 3 are anchored to the mounting bracket 4 by means of four rivets 13. Bolts or other fastening means could be used if appropriate but 'pop' rivets are perfectly suitable and can be fitted from the outsides of the mounting bracket 4.

Each shaft holder 3 is as most clearly shown in Figures 4 to 6 and has a shaft support portion 12 which is generally C-shaped to pass mostly but not all the way around the end of the pivot shaft 2, and has a zone of weakness created by cutaway portions 14 at an angular position diametrically opposite the split in the 'C' shape of the support portion 12. The shaft holders 3 are therefore most liable to fracture along the line indicated A-A in Figures 2 and 6. On opposite sides of that line A-A the shaft holders 3 have mounting flanges 15 with one hole 16 being formed in each flange 15 to receive one of the rivets 13. The holes 16 therefore define the anchorage points for anchoring the shaft holders 3 to the mounting bracket 4, and of course there are corresponding holes formed in the mounting bracket 4 itself.

Small protrusions 17 formed one on each shaft holder 3 cooperate with corresponding recesses formed in the mounting bracket 4 to help in the location of the shaft holders on the mounting bracket and to ensure that they can be mounted only in a predetermined angular alignment.

The mounting bracket is designed such that in the case of a front-end impact of the vehicle, the mounting bracket deforms to the general shape shown in Figure 4. That



spreads apart the rivets 16 and causes both of the shaft holders 3 to fracture along the line A-A. The ends of the pivot shaft 2 are released, and the pedal is released to fall away under the inertia pressure of the driver's foot.

Figures 1 to 4 show the shaft holders 3 as being mounted in a vertical orientation on the mounting bracket 4, with their mounting holes vertically one above the other. That is suitable for a mounting bracket as shown in Figures 1 and 4, but any other orientation from the vertical to the horizontal is possible, depending of the design of the mounting bracket and the line along which it is designed to spread apart in the case of a front-end impact of the vehicle.

CLAIMS

1. A pedal box for pivotally mounting one or more control pedals of an automobile, wherein a pivot shaft for one or more pedals is pivotally supported between side rails of a mounting bracket in such a manner that the pivot shaft is released from the side rails in the event of a front-end impact of the automobile, characterised in that each end of the pivot shaft is received in a shaft holder which comprises a shaft support portion supporting the pivot shaft end, a pair of spaced anchorages secured to a side rail on opposite sides of the shaft support portion, and a line of weakness formed across the shaft support portion, the pedal mounting bracket being designed so that on a front-end impact of the automobile the spaced anchorages of each shaft holder will spread apart, causing fracture of the shaft holders across their shaft support portions, and release of both ends of the pivot shaft of the pedal or pedals.
2. A pedal box according to claim 1, wherein the shaft support portion of each shaft holder is C-shaped and thereby only partially surrounds the associated pivot shaft end.
3. A pedal box according to claim 2, wherein the shaft holders are aligned so that the pivot shaft ends are biased in the direction of the openings in the C-shaped shaft support portions when excess force is applied to the pedal or pedals in a front-end impact.
4. A pedal box according to claim 2 or claim 3, wherein the line of weakness is formed on the shaft support portion at an angular position diametrically opposite the opening in the C-shaped shaft support portion.
5. A pedal box according to any preceding claim, wherein the line of weakness is a cutaway portion of the shaft support portion.

6. A pedal box according to any preceding claim, wherein the pivot shaft is shorter in length than the distance between the internal surfaces of the opposed side walls of the mounting bracket, and the shaft holders extend towards each other from the opposed side walls.

7. A pedal box according to any preceding claim, wherein the shaft holders are mounted on the outside surfaces of the opposed side walls of the mounting bracket.

8. A pedal box according to any preceding claim, wherein the shaft holders are die-cast from metal.

9. A pedal box according to any of claims 1 to 7, wherein the shaft holders are formed from a plastics material.

10. A pedal box according to any of claims 1 to 7, wherein the shaft holders are formed from a ceramic.

11. A pedal box substantially as hereinbefore described with reference to, and as illustrated in, the accompanying drawings.

Amendments to the claims have been filed as follows

1. A pedal box for pivotally mounting one or more control pedals of an automobile, wherein a pivot shaft for one or more pedals is pivotally supported between side rails of a mounting bracket in such a manner that the pivot shaft is released from the side rails in the event of a front-end impact of the automobile, characterised in that each end of the pivot shaft is received in a shaft holder which comprises a shaft support portion supporting the pivot shaft end, a pair of spaced anchorages secured to a side rail on opposite sides of the shaft support portion, and a line of weakness formed across the shaft support portion, the pedal mounting bracket being designed so that on a front-end impact of the automobile the spaced anchorages of each shaft holder will spread apart, causing fracture of the shaft holders across their shaft support portions, and release of both ends of the pivot shaft of the pedal or pedals.
2. A pedal box according to claim 1, wherein the shaft support portion of each shaft holder is C-shaped and thereby only partially surrounds the associated pivot shaft end.
3. A pedal box according to claim 2, wherein the shaft holders are aligned so that the pivot shaft ends are biased in the direction of the openings in the C-shaped shaft support portions when excess force is applied to the pedal or pedals in a front-end impact.
4. A pedal box according to claim 2 or claim 3, wherein the line of weakness is formed on the shaft support portion at an angular position diametrically opposite the opening in the C-shaped shaft support portion.
5. A pedal box according to any preceding claim, wherein the line of weakness is a cutaway portion of the shaft support portion.

6. A pedal box according to any preceding claim, wherein the pivot shaft is shorter in length than the distance between the internal surfaces of the opposed side walls of the mounting bracket, and the shaft holders extend towards each other from the opposed side walls.

7. A pedal box according to any preceding claim, wherein the shaft holders are mounted on the outside surfaces of the opposed side walls of the mounting bracket.

8. A pedal box according to any preceding claim, wherein the shaft holders are die-cast from metal.

9. A pedal box according to any of claims 1 to 7, wherein the shaft holders are formed from a plastics material.

10. A pedal box according to any of claims 1 to 7, wherein the shaft holders are formed from a ceramic.

11. A pedal box substantially as hereinbefore described with reference to, and as illustrated in, the accompanying drawings.



INVESTOR IN PEOPLE

Application No: GB 0010432.3  
Claims searched: 1 - 10

Examiner: Peter Gardiner  
Date of search: 11 December 2000

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.R): B7B: BSBA, BSBNC, BSDA, BSDB, BSES

Int CI (Ed.7): B60R: 21/00, 21/02, 21/09  
B60T: 7/06  
G05G: 1/14

Other: Online: WPI, EPODOC, JAPIO

### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	EP 0827874 A2 ADAM OPEL (see abstract and figures 1 and 2 in particular)	
A	EP 0659615 A1 ADAM OPEL (see abstract and figures 4 and 5 in particular)	

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